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ABSTRACT

In preparation for developing a position statement for the National Science Teachers Association (NSTA) on the preparation and certification of elementary and middle/junior high school science teachers, several NSTA committees conducted a survey of 50 colleges and universities with teacher education programs. Results of the survey (N=45) are presented, question by question, along with some explanations. Selected findings indicate that: (1) 44 of the colleges require students in elementary teacher education to complete science courses (a median of 8 semester hours for all colleges), although only 8 require courses in all three science areas (biological, physical, and earth sciences); (2) 42 require courses in elementary science teaching methods, many emphasizing science process, methods, and teaching techniques more than content; (3) for middle schools teacher education, 29% of the responding colleges have programs specifically for this level with an average of 30 semester hours of science required, only two requiring a specific science methods course for this level; (4) one-third of the colleges offer science education programs specifically for junior high level and more than half of those without a specific program include it as part of the secondary science teacher preparation program. (DC)

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SURVEY RESULTS

PRESERVICE PREPARATION OF TEACHERS OF SCIENCE AT THE ELEMENTARY, MIDDLE, AND JUNIOR HIGH SCHOOL LEVELS

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Dr. Ken Mechling, Director
Division of Teacher Education

March 1, 1982

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I. RATIONALE FOR THE SURVEY

The three National Science Foundation (NSF) studies conducted during the late 1970's reported a myriad of problems related to the teaching of science in the elementary schools of the United States. Little time was devoted to science instruction and a significant number of teachers felt "not well qualified" to teach science (1). Case studies of elementary schools revealed that science had been deemphasized, with many teachers ignoring it completely (2).

Inadequate teacher preparation is often identified as the cause of the sorry state of science at the elementary school level. For instance, surveys of state science supervisors and elementary school principals found that both groups considered inadequate teacher preparation in science to be a serious problem in their schools (3). There appears to be a need for improved teacher preparation programs in science for preservice elementary teachers.

Science teacher preparation for the middle and junior high school levels is also fraught with problems. For a long time it has been assumed that "anyone" can teach middle/junior high school science. Teachers prepared for biology, chemistry or physics at the senior high school levels end up teaching seventh and eighth grade general science. Elementary teachers with minimum preparation in the sciences are hired to teach ninth grade physical science. There appears to be a real need to establish guidelines for the preparation of science teachers specifically for the middle/junior high school levels (4).

Although some uniform guidelines and standards for the preparation and certification of teachers of science do exist, such as those prepared by the Commission on Science Education of the American Association for the Advancement of Science (5), they have not changed in more than a decade. The NSF science education needs analysis of 1980 noted that the three earlier NSF studies had neglected the preservice training of teachers, yet good preservice programs are the best insurance for qualified teachers (6). The authors concluded that it is much more difficult to correct deficiencies, particularly in the academic backgrounds of teachers once they have been certified, than it is to require adequate preparation prior to certification. There is a clear need for the profession, with NSTA as its representative, to recognize needs in the area of preparation and certification of teachers of science and take action for improvement.

II. PURPOSE OF THE SURVEY

During 1981, the Division of Teacher Education of the National Science Teachers Association (NSTA) accepted the task of planning strategies for developing NSTA position statements regarding the preparation and certification of teachers of science at the elementary and middle/junior high school levels.

Four NSTA Committees--Teacher Education, along with Preschool/Elementary, Middle/Junior High School, and Research--have worked in concert at this task. Representatives of these committees met in San Antonio on August 3, 1981, and decided to seek a baseline of data on science teacher preparation. We believed that we should find out what current practices were before we say what they should be.

Our charge was to develop and conduct a survey to obtain descriptive data on elementary and middle/junior high school teacher preparation programs at selected colleges and universities.

III. SOURCE OF DATA

Fifty (50) colleges and universities were sampled in this survey. All are members of the American Association of Colleges for Teacher Education (AACTE) and identified by AACTE as member institutions having the largest number of teacher education graduates during the 1979-80 academic year.

On December 4, 1981, questionnaires and cover letters were sent to the Deans of Education of all fifty (50) of the selected colleges and universities. On January 15, 1982, a follow-up letter was sent to those institutions which had not responded to the first request. The appendices include the names and addresses of the colleges and universities, a copy of the questionnaire, and copies of the cover letters sent to the Deans of Education.

IV. DATA AND DISCUSSION

A. Respondents

1. During December, 1981 and January, 1982 a questionnaire titled, "Preservice Preparation of Teachers of Science at the Elementary, Middle and Junior High School Levels" was sent to Deans of Education in fifty (50) teacher-producing colleges and universities in the United States. A total of forty-five (45) completed questionnaires (90%) were returned.

Following is a listing of respondents according to category of position or title.

Position or Title	Respondents	Percent
Dean of Education	1	2%
Associate/Assistant Dean of Education	6	13%
Professor of Science Education	13	29%
Professor of Education	20	45%
Other	5	11%

Most respondents had responsibilities related to science education. Most in the categories, "Professor of Education" and "Other," were instructors or administrators in science education programs housed in departments of curriculum and instruction.

B. Elementary Teacher Preparation

1. ARE ELEMENTARY TEACHER CANDIDATES REQUIRED TO COMPLETE SCIENCE COURSES?

44 (98%) Yes 1 (2%) No

All colleges and universities except one required elementary teacher candidates to complete science courses.

2. ARE ELEMENTARY TEACHER CANDIDATES REQUIRED TO TAKE SCIENCE COURSES AS A PART OF THEIR GENERAL EDUCATION REQUIREMENTS, THEIR PROFESSIONAL EDUCATION REQUIREMENTS OR BOTH?

a.	18	(41%)	General Education
b.	2	(5%)	Professional Education
c.	24	(54%)	Both

3. IN WHICH OF THE FOLLOWING AREAS ARE ELEMENTARY TEACHER CANDIDATES REQUIRED TO TAKE COURSES?

a.	18	(22%)	Physical Sciences
b.	19	(23%)	Biological Sciences
c.	10	(12%)	Earth Sciences
d.	21	(25%)	Any of the above may be elected
e.	8	(9%)	Of the above a, b, and c are required
f.	8	(9%)	Other

There were a total of eighty-four (84) responses in all categories (a.) through (f.). Many respondents checked two letters such as (a.) and (b.) or (a.) and (f.). Almost one-half of the respondents marked only (d.) indicating that while physical science, biological science, and earth science are required, students may elect one or two of these areas while excluding the other(s). Only eight (8) respondents indicated that their elementary education candidates were required to take courses in all three (3) areas.

4. ARE SPECIFIC SCIENCE COURSES REQUIRED?

24	(55%)	Yes	
20	(45%)	No	

The twenty-four (24) respondents from schools which require specific science courses all provided course titles. These titles were generalized into categories such as earth science, physical science (including chemistry and physics), biological science, etc. The categories, numbers of respondents, and percentages appear next.

Course Title Categories	Number	Percent
Biological Science, Physical Science, Earth Science	8	34%
Biological Science and Physical Science	7	29%
Biological Science and Earth Science	1	4%
Physical Science and Earth Science	1	4%
Biological Science only	1	4%
Physical Science only	1	4%
Earth Science Only	1	4%
General Science	1	4%
Physical Geography	1	4%
Other	2	9%

Approximately two-thirds of the respondents indicated that both biological science and physical science were required courses. Almost one-half were required to take earth science courses.

If we look closely at these data in conjunction with the responses to number 3. where students may elect courses from among the three major science categories, we find a rather interesting phenomenan. Assuming that the elective requirements in 3.d. allow students to opt out in one area, say physical science, and another one-third (shown in 4.) are not required to take physical science courses, it would be possible for more than one-half of all elementary teacher candidates to elect not to take a physical science course. The chances of students electing not to take earth science courses are even greater.

The important point to note here is that only eight (8) (18%) of the responding colleges and universities require elementary teacher candidates to take courses in the biological, physical, and earth sciences. It appears that fully 82% provide students with the option of electing not to take courses in all three (3) of these areas.

Another interesting finding was that in five (5) (21%) of the responses the course titles indicated identifiers specifically for elementary teachers, titles such as " Introductory Biology for Elementary Teachers." It would be interesting to know if such courses were specifically designed to serve the needs of elementary teacher candidates.

5. FOR ELEMENTARY TEACHER CANDIDATES, HOW MANY TOTAL CREDITS HOURS OF SCIENCE ARE REQUIRED? N = 44

Range = 0 to 18 credits
Mean = 9.3 credits
Median = 8 credits
Mode = 8 credits

The results indicate that elementary teacher candidates are required to take either two (2) or three (3) science courses, usually three (3). Comparing the colleges and universities which require specific science courses to those which do not, we find that the group with specific demands require an average of 10.5 credits of science compared to about eight (8) credits for those not requiring specific courses.

6. IF SCIENCE COURSES ARE REQUIRED, ARE THEY DESIGNED SPECIFICALLY TO MEET THE NEEDS OF PRESERVICE ELEMENTARY TEACHERS?

16	(37%)	Yes	26 (59%)	No
1	(2%)	Other	1 (2%)	No Response

The results here are clear. Only a few more than one-third of the colleges and universities design their science courses specifically to meet the needs of elementary teacher candidates.

7. DO ELEMENTARY TEACHER CANDIDATES USUALLY ELECT ADDITIONAL SCIENCE COURSES ON THEIR OWN?

1	(2%)	Yes	43 (98%)	No

8. COUNTING REQUIRED SCIENCE COURSES AND ELECTIVE SCIENCE COURSES (BUT EXCLUDING SCIENCE METHODS COURSES), APPROXIMATELY HOW MANY CREDIT HOURS IN SCIENCE DO ELEMENTARY TEACHER CANDIDATES ACCUMULATE BY GRADUATION?

N = 45
Range = 0 to 18 credits
Mean = 9 credits
Median = 8 credits
Mode = credits

It is clear that preservice elementary teachers take no more science courses than they are required to take. What we do not know is whether this is by their choice, whether there is no room for more credits in their programs, or whether other factors may be involved.

9. DO THE SCIENCE COURSES TAKEN BY THE ELEMENTARY TEACHER CANDIDATES INCLUDE LABORATORY EXPERIENCES AND ACTIVITIES IN ADDITION TO LECTURE?

a.	32	(73%)	Yes
b.	7	(16%)	No
c.	5	(11%)	Some do, some don't

The data show that approximately three-fourths of the respondents offer science courses which include laboratory experiences and activities.

10. ARE PRESERVICE ELEMENTARY TEACHERS TAUGHT SCIENCE PROCESS SKILLS SUCH AS OBSERVATION, MEASUREMENT, PREDICTION, ANALYSIS OF DATA, CONTROL OF VARIABLES, DESIGN OF INVESTIGATIONS, ETC.?

a.	34	(76%)	Yes
b.	6	(13%)	No
c.	1	(2%)	Yes & No
d.	4	(9%)	Yes, in methods

One out of eight preservice elementary teachers are not taught science process skills.

11. DO YOUR PRESERVICE ELEMENTARY TEACHERS TAKE A SCIENCE TEACHING METHODS COURSE DESIGNED TO ASSIST THEM TO LEARN HOW TO TEACH SCIENCE OR IS SCIENCE INCLUDED IN A GENERAL METHODS OF INSTRUCTION COURSE?

a.	40	(89%)	Science Methods Course
b.	2	(5%)	General Methods Course
c.	2	(5%)	They do both
d.	1	(5%)	No response

Forty (40) of the forty-five (45) colleges and universities surveyed have their preservice elementary teachers take a science methods course. The number of credits vary from one (1) to three (3), all semester credits. They are as follows:

Number of Credits	Number of Respondents	Percent
3	26	65%
2	12	30%
1	2	5%

12. IN YOUR ESTIMATION, WHAT FACTORS HAVE HAD THE MOST INFLUENCE IN DETERMINING THE SCIENCE AND/OR SCIENCE TEACHING METHODS COURSE REQUIREMENTS FOR ELEMENTARY TEACHER CANDIDATES?

N = 45

a. 16 (23%) Tradition
b. 10 (14%) Accreditation Agencies such as NCATE
c. 20 (28%) State Certification Guidelines
d. 12 (17%) Professional Science Association Guidelines
e. 13 (18%) Other

Although state certification guidelines received the greatest number of responses, it appears that all of these factors play an important role in determining science-related requirements for elementary teacher candidates. Most of the responses in the "Other" category referred to the strength, interest, and competence of the faculty as being most influential.

13. IN YOUR PROGRAM, HOW MUCH EMPHASIS IS PLACED ON THE FOLLOWING SCIENCE EDUCATION AREAS?

N = 45

Science Content:
14 (31%) Much 22 (49%) Some 9 (20%) Little 0 Don't Know

Science Process and Methods:
28 (62%) Much 15 (33%) Some 2 (5%) Little 0 Don't Know

Science Teaching Techniques:
30 (67%) Much 12 (27%) Some 3 (6%) Little 0 Don't Know

Among the responding colleges and universities there is substantially more emphasis placed on science process and methods and science teaching techniques than on science content. Almost seventy percent (70%) of the respondents indicated that content received some or little emphasis. In the "much" category, responses run two-to-one in favor of emphasis on process, methods, and teaching techniques compared to content.

14. DO YOU THINK YOUR SCIENCE CREDIT HOUR REQUIREMENTS FOR PRESERVICE ELEMENTARY SHOULD BE CHANGED?

N = 44

Science Content:
18 (41%) No Change Needed 26 (58%) More Is Needed 0 Less Is Needed

Science Processes and Methods:

23	(52%)	No Change Needed	21 (48%)	More Is Needed	0 Less Is Needed

Science Teaching Techniques:

22	(50%)	No Change Needed	22 (50%)	More Is Needed	0 Less Is Needed

Among the respondents the data shows a clearly perceived need for more credit hour requirements in all science areas; content, processes and methods, and teaching techniques. Approximately one-half feel that more hours should be required in all three categories, with science content being the area of greatest need.

15. AS YOU CONSIDER YOUR PROGRAM FOR PREPARING PRESERVICE ELEMENTARY TEACHERS FOR TEACHING SCIENCE, HOW WOULD YOU RATE ITS OVERALL EFFECTIVENESS?

N = 44

5	(11%)	Excellent	24 (55%)	Good	12 (27%) Adequate
3	(7%)	Poor	0	Don't Know	

Two-thirds of the respondents rank their science preparation programs as excellent or good. One-third rank them as adequate or poor.

16. ALL THINGS CONSIDERED, HOW COULD ELEMENTARY TEACHER CANDIDATES BE BETTER PREPARED TO TEACH SCIENCE?

Forty (40) of the forty-five (45) respondents wrote one or more comments in response to this open-ended question. Altogether, fifty-two (52) suggestions were made for better preparing elementary education candidates to teach science. The suggestions were arranged into categories according to similarities. Those categories which received three (3) or more responses are listed below.

Suggestions for Improving the Science Preparation of Elementary Teacher Candidates	Number	Percent
Provide more science content courses	10	20%
Provide more courses in methods of teaching science	9	17%
Require laboratory courses in biological science, physical science, and earth science; courses which are specially designed for elementary teachers	7	13%
Require students to spend more time in schools	5	10%
Achieve a better integration of science content, processes, and teaching methods	5	10%
Require science teaching as a must during student teaching	3	6%
Other responses	13	24%

C. Middle School Teacher Preparation (Grades 4-9)

1. DO YOU HAVE A TEACHER PREPARATION PROGRAM DESIGNED SPECIFICALLY TO PREPARE TEACHERS OF SCIENCE FOR THE MIDDLE SCHOOL LEVELS (GRADES 4-9)?

13 (29%) Yes	32 (72%) No

Twenty-nine percent (29%) of the forty-five (45) respondents indicated that they offered teacher preparation programs specifically for the middle school levels.

2. IF YOU RESPONDED YES TO NUMBER 1, PLEASE DESCRIBE THE SCIENCE REQUIREMENTS OF YOUR MIDDLE SCHOOL SCIENCE TEACHER PREPARATION PROGRAM IN TERMS OF COURSE REQUIREMENTS AND CREDIT HOURS.

The responses (N = 13) showed a wide variety of combinations of required and elected science courses with choices for students to elect among concentrations, majors, and minors.

Range = 13 to 67 semester hours of science
Mean = 30 semester hours of science
Median = 29 semester hours of science
Mode = 30 semester hours of science

None of the credit hours include methods courses which are additional.

3. IF YOU RESPONDED NO TO NUMBER 1, DO TEACHERS BEING PREPARED FOR THE MIDDLE SCHOOL NORMALLY COMPLETE THE SCIENCE REQUIREMENTS FOR ELEMENTARY OR SECONDARY TEACHER PREPARATION LEVELS? PLEASE X APPROPRIATE SPACES. N = 32

5 (16%)	Elementary
9 (28%)	Secondary
16 (50%)	Elementary and Secondary
1 (3%)	Other
1 (3%)	No Response

Most responses indicated "Elementary" and "Secondary." Explanations mostly focused on the broad grade range of the middle school (grades 4-9) with teachers preparing for the upper levels (grades 7-9) completing the secondary requirements and teachers preparing for the lower levels (grades 4-6) completing the elementary requirements.

It is interesting to note that even with the wide range in grade levels for the middle school, approximately forty percent (40%) of the teachers complete the science requirements for either elementary or secondary. This could result in instances where teachers prepared primarily for the secondary levels end up teaching fifth grade or teachers prepared for the elementary levels end up teaching ninth grade.

4. PLEASE INDICATE WITH AN X THE NATURE OF YOUR SCIENCE TEACHING METHODS COURSE REQUIREMENT FOR PRESERVICE MIDDLE SCHOOL SCIENCE TEACHERS.

a.	4 (9%)	No methods course is required.
b.	2 (5%)	Science teaching methods are included in a general methods course.
c.	30 (67%)	A complete course in elementary or secondary science teaching methods is required.
d.	2 (5%)	A specific science teaching methods course for middle school science teachers is required.
e.	3 (7%)	Other.
f.	1 (2%)	c. & d.
g.	1 (2%)	c. or d.
h.	1 (2%)	b. & d.
i.	2 (2%)	No response.

Two-thirds of the respondents indicated that teachers of the middle school are required to take either an elementary or secondary science teaching methods course. Only two (2) colleges and universities out of the forty-five (45) respondents indicated that a specific science teaching methods course for middle school science teachers was required.

D. Junior High School Science Teacher Preparation (Grades 7-9)

1. DO YOU HAVE A TEACHER PREPARATION PROGRAM DESIGNED TO PREPARE SCIENCE TEACHERS SPECIFICALLY FOR THE JUNIOR HIGH SCHOOL LEVEL (GRADES 7-9)?

15 (33%) Yes 30 (67%) No

One-third (33%) of the forty-five (45) respondents have programs to prepare science teachers specifically for the junior high school level (grades 7-9).

2. IF YOU ANSWERED YES TO NUMBER 1, PLEASE DESCRIBE THE SCIENCE REQUIREMENT OF YOUR JUNIOR HIGH SCHOOL SCIENCE TEACHER PREPARATION PROGRAM IN TERMS OF COURSE REQUIREMENTS AND CREDIT HOURS.

N = 14
Range = 18 to 63 credits in science
Mean = 38
Median = 39
Modes = 24 and 42

Among the fourteen respondents a variety of science courses was required. The categories, numbers of responses, and percentages are as follows.

Science Area Requirements	Respondents	Percent
Biological Science, Physical Science and, Earth Science	9	65%
Biological Science and Physical Science	1	7%
Biological Science and Earth Science	1	7%
Any Science Area	1	7%
No Indication of Area	2	14%

Among those colleges and universities with junior high school science teacher preparation programs, an average of thirty-eight (38) semester credits of science was required. Two thirds (N = 9) of the programs required courses in all three (3) science areas; biological science, physical science, and earth science.

3. IF YOU ANSWERED NO TO NUMBER 1, HOW ARE SCIENCE TEACHERS PREPARED FOR THE JUNIOR HIGH SCHOOL LEVELS?

N = 29

a. 2 (7%) The requirements are the same as our elementary teacher preparation program.

b. 1 (4%) There is a broad field science preparation with courses required in the biological, physical, and earth sciences.

c. 16 (55%) Secondary or senior high school preparation in the major areas of biology, chemistry, physics or earth science assumes preparation for teaching science at the junior high school level.

d. 0 Other, please describe.

e. 5 (17%) a. or c.

f. 4 (14%) b. or c.

g. 1 (4%) a. or b. or c.

A majority (55%) of the responding colleges and universities which do not have programs specifically designed to prepare science teachers for the junior high school level depend upon secondary science teacher preparation programs to prepare junior high teachers. Six (6) (21%) provide preservice junior high school science teacher candidates with a choice of following an elementary or a secondary track.

4. PLEASE DESCRIBE THE SCIENCE PREPARATION OF A TYPICAL PRESERVICE JUNIOR HIGH SCHOOL SCIENCE TEACHER IN TERMS OF COURSE REQUIREMENTS AND CREDIT HOURS. (Respondents include colleges and universities without science teacher preparation programs specifically for the junior high school.)

N = 20
Range = 19 to 67 credits in science
Mean = 42
Median = 46
Mode = 48

Among the colleges and universities without specific junior high school science teacher preparation programs, an average of forty-two (42) semester credits of science was required. Almost all of these programs were secondary school science teacher preparation programs. No distinction was made for the junior high school level.

5. PLEASE INDICATE WITH AN X THE TYPE OF SCIENCE TEACHING METHODS COURSE REQUIREMENT FOR PRESERVICE JUNIOR HIGH SCHOOL SCIENCE TEACHERS.

a. 4 (10%) No methods course is required.

b. 3 (8%) Science teaching methods are included in a general methods course.

c. 27 (69%) A complete course in secondary school science teaching methods is required.

d. 2 (5%) A specific science teaching methods course for the junior high school is required.

e. 3 (8%) Other, please describe.

Clearly, in most (69%) colleges and universities, preservice junior high school science teachers are required to complete a secondary school science teaching methods course. Only 5% of the colleges and universities require a science teaching methods course specifically for the junior high school level.

V. SUMMARY

A. Elementary Teacher Preparation

1. All colleges and universities except one, forty-four (44) out of forty-five (45), required elementary teacher candidates to complete science courses.

2. Only eight (8) (18%) of the colleges and universities required elementary teacher candidates to complete science courses in all three areas; biological science, physical science, and earth science. In most institutions (82%) candidates could elect one or two of these areas while excluding the other(s).

3. Among the colleges and universities surveyed, the median number of semester hours of science credits required of elementary teacher candidates was eight (8).

4. Approximately one-third of the colleges and universities design their science courses specifically to meet the needs of elementary teacher candidates.

5. In ninety-eight percent (98%) of the colleges and universities, candidates elect no additional science courses beyond those required.

6. Approximately three-fourths of the colleges and universities require science courses for elementary teacher candidates which include laboratory experiences and activities designed to teach science process skills.

7. Forty-two (42) of the forty-five (45) colleges and universities require elementary teacher candidates to take a course in science teaching methods.

8. State certification guidelines and tradition are cited most often as the factors which have had the most influence in determining science-related requirements for elementary teacher candidates.

9. Among the responding colleges and universities there is substantially more emphasis placed on science process, methods, and teaching techniques than on science content.

10. The responding colleges and universities show a clearly perceived need for more credit hour requirements in all science-related areas; content, processes and methods, and teaching techniques. Approximately one-half of them indicated that more hours should be required in all three categories, with science content being the area of greatest need.

11. Two-thirds of the respondents ranked their science preparation programs for elementary teacher candidates as excellent or good. One-third ranked them as adequate or poor.

12. When asked for suggestions for improving the science preparation of elementary teacher candidates, the three which were received most often were:

    a. Provide more science courses.
    b. Provide more courses in methods of teaching science.
    c. Require laboratory courses in biological science, physical science, and earth science; courses which are specially designed for elementary teachers.

B. Middle School Teacher Preparation

1. Twenty-nine percent (29%) of the forty-five (45) responding colleges and universities indicated that they offered teacher preparation programs specifically for the middle school levels. Thirty (30) semester hours of science was the average requirement in these programs.

2. It appears that because of the broad grade range of the middle school (grades 4-9), teachers preparing for the upper levels (grades 7-9) complete the secondary science requirements and teachers preparing for the lower levels (grades 4-6) complete the elementary requirements.

3. Only two (2) (5%) of the responding colleges and universities indicated that a specific science teaching methods course for middle school science teachers was required.

C. Junior High School Science Teacher Preparation

1. One-third of the forty-five (45) responding colleges and universities have programs to prepare science teachers specifically for the junior high school level (grades 7-9).

2. More than one-half of the colleges and universities without specially designed junior high school science teacher preparation programs include preservice junior high teachers as a part of their secondary science teacher preparation programs.

3. The semester hour requirements in science averaged thirty-eight (38) for candidates in specially-designed junior high school science teacher preparation programs and forty-two (42) for junior high school candidates included in secondary science teacher preparation programs.

4. Only 5% of the responding colleges and universities require a science teaching methods course designed specifically for the junior high school level. Most (69%) colleges and universities require preservice junior high school science teachers to complete a secondary school science teaching methods course.

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COLLEGES AND UNIVERSITIES SURVEYED

American Association of Colleges for Teacher Education Members

Name and Address	Responded Yes	No
University of Arizona Tucson, AZ 85721	*	
University of Houston Houston, TX 77004	*	
Brigham Young University Provo, UT 84601	*	
Boston University Boston, MA 02215	*	
Central Connecticut State College New Britain, CT 06050	*	
The University of Alabama University, AL 35486	*	
Trenton State College Trenton, NJ 08625	*	
The University of Alabama in Birmingham Birmingham, AL 35294	*	
Kent State University Kent, OH 44242	*	
California State University, Los Angeles Los Angeles, CA 90032	*	
University of Texas at Austin Austin, TX 78712	*	
University of Nebraska-Lincoln Lincoln, NE 69599	*	
New York University New York, NY 10003	*	
University of Tennessee at Knoxville Knoxville, TN 37916	*	
University of South Carolina Columbia, SC 29208	*	
Oklahoma State University Stillwater, OK 74074	*	

Name and Address	Yes	No
University of Southern California Los Angeles, CA 90007	*	
C. W. POST Center, Long Island University Greenvale, NY 11548	*	
Appalachian State University Boone, NC 28608	*	
North Texas State University Denton, TX 76203	*	
Pan American University Edinburg, TX 78539	*	
San Jose State University San Jose, CA 95192	*	
Northeast Missouri State University Kirksville, MO 63501	*	
University of Washington Seattle, WA 98195	*	
University of Wisconsin-Madison Madison, WI 53706	*	
The City College New York, NY 10031	*	
The Pennsylvania State University University Park, PA 16802	*	
University of Michigan Ann Arbor, MI 48109		*
Bowling Green State University Bowling Green, OH 43403	*	
Western Michigan University Kalamazoo, MI 49001		**
Georgia State University Atlanta, GA 30303	*	
Temple University Philadelphia, PA 19122	*	
Illinois State University Normal, IL 61761	*	
East Texas State University Commerce, TX 75428	*	

**Response received too late to be included in the data analysis.

Name and Address	Yes	No
Glassboro State College Glasboro, NJ 08028	*	
Central Michigan University Mount Pleasant, MI 48859		*
Arizona State University Tempe, AZ 85281	*	
University of Georgia Athens, GA 30602	*	
Eastern Michigan University Ypsilanti, MI	*	
East Carolina University Greenville, NC 27834	*	
Northern Illinois University Dekalb, IL 60115	*	
The Ohio State University Columbus, OH 43210	*	
Teachers College, Columbia University New York, NY 10027		*
Western Kentucky University Bowling Green, KY 42101	*	
Wayne State University Detroit, MI 48202	*	
Indiana University Bloomington, IN 47401	*	
Ball State University Muncie, IN 47306	*	
Michigan State University East Lansing, MI 48824		*
University of Northern Colorado Greeley, CO 80638	*	
San Diego State University San Diego, CA 92115	*	

NATIONAL SCIENCE TEACHERS ASSOCIATION

1742 Connecticut Avenue, NW, Washington D.C. 20009 (202) 328-5800

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Syracuse University, New York

Stanley Helgeson, *NARST*
The Ohio State University, Columbus

December 4, 1981

Dear Colleague:

Recent reports indicate that science education in the United States is in serious trouble. One recent study by the National Science Foundation found that the overwhelming majority of elementary school teachers felt "not well qualified" to teach science. A related study reported that fewer than half of the nation's youngsters have a single elementary school year in which their teacher gives science a substantial share of the curriculum and does a good job of teaching it. At the middle and junior high school levels, little is known about science teaching except that these are crucial years in the lives of the youngsters and few teachers are specially prepared to teach them. Of course, these are not the only problems facing us, but they are the target of our current effort to improve science education through improved teacher preparation.

NSTA needs your help. We are surveying 50 major colleges and universities to determine their preparation programs for teachers of science at the elementary, middle, and junior high school levels. Our ultimate objective is to develop guidelines for the preparation and certification of teachers of science at these levels. The information we are requesting from you is very important to the success of our project.

Our schedules are busy and there are many demands on our time, but experience has proven that most of us in education are willing to give a little chunk of our time to an effort which may result in an improvement in the teaching profession. This is such an effort.

We would be most grateful if you could take 20 to 30 minutes to complete the enclosed questionnaire, providing all of the answers you possibly can. If, after examining the questionnaire, you feel that there is someone else at your institution who may be able to respond more accurately, we would appreciate it if you would ask them to complete it.

Those who do surveys always hope to get the responses back quickly...and we are no exception. We'd appreciate receiving a response from you as soon as possible, hopefully sometime near the

Dr. Kenneth R. Mechling
Professor of Biology and Science Education
Clarion State College
Clarion, Pennsylvania 16214
(814) 226-2561

30th NSTA National Convention, Chicago, Illinois, April 2-5, 1982

beginning of January. Please return the completed questionnaire to me, Ken Mechling, Chairman, Biology Department, Clarion State College, Clarion, PA, 16214. A stamped, self-addressed envelope is provided for your convenience.

If you have additional descriptive information about your science requirements or preparation program for elementary, middle, or junior high school teachers which you believe may be useful to us, we'd appreciate receiving it. Also, if you wish to discuss any aspect of the questionnaire or if you need a clarification, please feel free to call me at my office, (814) 226-2273.

Please accept my most sincere thanks for your cooperation. We are looking forward to hearing from you.

Sincerely,

Ken Mechling

Ken Mechling, Director
NSTA Division of Teacher Education

KM/pb

Enclosures

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Syracuse University, New York

Stanley Helgeson, *NARST*
The Ohio State University, Columbus

January 15, 1982

Dean of Education
New York University
New York, NY 1003

Dear Colleague:

During early December, I sent you a questionnaire titled "Preservice Preparation of Teachers of Science at the Elementary, Middle, and Junior High School Levels." Although we have received an excellent return thus far, (well over 60 percent) we have not yet received a response from New York University.

Given the holiday mails and vacation periods we recognize the many delays that can be encountered. In the hope that we can receive data from 90 percent or more of the 50 major higher education institutions with teacher preparation programs, I have enclosed another copy of our explanatory cover letter and the questionnaire. We would appreciate it very much if you would pass this information along for completion by someone knowledgeable about preservice teacher preparation in the sciences at the elementary and middle school levels.

We are hopeful that we can receive a response from your institution by the end of January so that we can proceed with our analyses. A stamped, self-addressed envelope is provided for your convenience.

We at NSTA are most grateful for your assistance as we work toward the development of guidelines for the preparation and certification of teachers of science in basic education. Thank you very much for your help.

Best wishes in this new year.

Sincerely,

Ken Mechling

Ken Mechling, Director
NSTA Division of Teacher Education

KM/mm

Enclosures

Dr. Kenneth R. Mechling
Professor of Biology and Science Education
Clarion State College
Clarion, Pennsylvania 16214
(814) 226-2561

QUESTIONNAIRE

PRESERVICE PREPARATION OF TEACHERS OF SCIENCE AT THE ELEMENTARY, MIDDLE, AND JUNIOR HIGH SCHOOL LEVELS

NATIONAL SCIENCE TEACHERS ASSOCIATION

1742 Connecticut Avenue, NW, Washington D.C. 20009 (202) 328-5800

Dr. Ken Mechling, Director
Division of Teacher Education
(814) 226-2273

College or University: _____

Your Name: _____

Title: _____

Address: _____

_____

Phone: ( ) _____

QUESTIONNAIRE
Preservice Preparation of Teachers of Science at the
Elementary, Middle, and Junior High School Levels

This questionnaire is designed to be completed by the Dean of Education or an appropriate designee within the School of Education or other academic unit responsible for the preservice preparation of teachers of science in the elementary, middle, and/or junior high schools.

PART I
ELEMENTARY TEACHER PREPARATION

1. Are elementary teacher candidates required to complete science courses?
_____ Yes _____ No

If you responded Yes to number 1, please go to 2 and complete the remaining items in Part I by placing X's or answers in the appropriate blanks. If your answer was No, go to 10.

2. Are elementary teacher candidates required to take science courses as a part of their general education requirements, their professional education requirements or both?
   a. _____ General Education
   b. _____ Professional Education
   c. _____ Both

3. In which of the following areas are elementary teacher candidates required to take courses?
   a. _____ Physical Sciences
   b. _____ Biological Sciences
   c. _____ Earth Sciences
   d. _____ Any of the above may be elected
   e. _____ Of the above, a, b, and c are required
   f. _____ Other, please describe _____

4. Are specific science courses required? _____ Yes _____ No
Please give course titles and credits.

Titles	Credits
a.	
b.	
c.	
d.	
e.	

5. For elementary teacher candidates, how many total credit hours of science are required? Credits _____
Are these semester or quarter credits? _____ Semester _____ Quarter

6. If science courses are required, are they designed specifically to meet the needs of preservice elementary teachers?
_____ Yes _____ No _____ Other, please explain _____

7. Do elementary teacher candidates usually elect additional science courses on their own?
_____ Yes _____ No

8. Counting required science courses and elective science courses (but excluding science methods courses), approximately how many credit hours in science do elementary teacher candidates accumulate by graduation? _____

9. Do the science courses taken by the elementary teacher candidates include laboratory experiences and activities in addition to lecture?

_____ Yes _____ No

10. Are preservice elementary teachers taught science processes skills such as observation, measurement, prediction, analysis of data, control of variables, design of investigations, etc.?

_____ Yes _____ No

11. Do your preservice elementary teachers take a science teaching methods course designed to assist them to learn how to teach science or is science included in a general methods of instruction course?

a. _____ Science Methods Course _____ Number of Credits
b. _____ General Methods Course _____ Number of Credits
c. _____ They do both.

12. In your estimation, what factors have had the most influence in determining the science and/or science teaching methods course requirements for elementary teacher candidates?

a. _____ Tradition
b. _____ Accreditation Agencies such as NCATE
c. _____ State Certification Guidelines
d. _____ Professional Science Association Guidelines
e. _____ Other, please describe _____

13. In your program, how much emphasis is placed on the following science education areas?

Science Content: ___Much ___Some ___Little ___Don't know
Science Process and methods: ___Much ___Some ___Little ___Don't know
Science Teaching Techniques: ___Much ___Some ___Little ___Don't know

14. Do you think your science credit hour requirements for preservice elementary should be changed?

Science Content: ___No Change Needed ___More Is Needed ___Less Is Needed
Science Processes and Methods: ___No Change Needed ___More Is Needed ___Less Is Needed
Science Teaching Techniques: ___No Change Needed ___More Is Needed ___Less Is Needed

15. As you consider your program for preparing preservice elementary teachers for teaching science, how would you rate its overall effectiveness?

___Excellent ___Good ___Adequate ___Poor ___Don't Know

16. All things considered, how could elementary teacher candidates be better prepared to teach science?

PART II

MIDDLE SCHOOL TEACHER PREPARATION (GRADES 4-9)

1. Do you have a teacher preparation program designed specifically to prepare teachers of science for the middle school levels (grades 4-9)?

   ____Yes (go to 2) ____No (go to 3)

2. If you responded YES to number 1, please describe the science requirements of your middle school science teacher preparation program in terms of course requirements and credit hours, then go to 4.

3. If you responded NO to number 1, do teachers being prepared for the middle school normally complete the science requirements for elementary or secondary teacher preparation levels? Please X appropriate spaces, then go to 4.

   ____Elementary

   ____Secondary

   ____Other, please describe

4. Please indicate with an X the nature of your science teaching methods course requirement for preservice middle school science teachers.

   a. ____No methods course is required.

   b. ____Science teaching methods are included in a general methods course.

   c. ____A complete course in elementary or secondary science teaching methods is required.

   d. ____A specific science teaching methods course for middle school science teachers is required.

   e. ____Other, please describe.

PART III

JUNIOR HIGH SCHOOL SCIENCE TEACHER PREPARATION (GRADES 7-9)

1. Do you have a teacher preparation program designed to prepare science teachers specifically for the junior high school level (grades 7-9)?
   _____Yes (go to 2) _____No (go to 3)

2. If you answered YES to number 1, please describe the science requirement of your junior high school science teacher preparation program in terms of course requirements and credit hours, then go to 5.

3. If you answered NO to number 1, how are science teachers prepared for the junior high school levels? Please X appropriate spaces, then continue to 4 and 5.
   a. _____The requirements are the same as our elementary teacher preparation program.
   b. _____There is a broad field science preparation with courses required in the biological, physical, and earth sciences.
   c. _____Secondary or senior high school preparation in the major areas of biology, chemistry, physics or earth science assumes preparation for teaching science at the junior high school level.
   d. _____Other, please describe.

4. Please describe the science preparation of a typical preservice junior high school science teacher in terms of course requirements and credit hours.

5. Please indicate with an X the type of science teaching methods course requirement for preservice junior high school science teachers.
   a. _____No methods course is required.
   b _____Science teaching methods are included in a general methods course.
   c. _____A complete course in secondary school science teaching methods is required.
   d. _____A specific science teaching methods course for the junior high school is required.
   e. _____Other, please describe.

Please accept our most sincere thanks for your co-operation.

Please mail the questionnaire in the enclosed envelope to:

DR. KEN MECHLING, DIRECTOR
NSTA DIVISION OF TEACHER EDUCATION
BIOLOGY DEPARTMENT
CLARION STATE COLLEGE
CLARION, PA 16214